

DRAFT, Version 1.1

Draft Management Recommendations for
Röll's golden log moss
Brotherella roellii (Ren. & Card. in Röhl) Fleisch.

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EXECUTIVE SUMMARY

Species: *Brotherella roellii* (Ren. & Card. in Röhl) Fleisch. (Röhl's golden log moss)

Taxonomic Group: Bryophyte: Moss

ROD Components: ROD Strategies 1 and 3 and Protection Buffer Species (ROD, p. C-27)

Other Management Status: None at present. Included on preliminary list of rare mosses submitted to the Washington Natural Heritage Program (Harpel and Gamon, pers. comm.) with suggested category S2 (imperiled in the state because of rarity or because it is vulnerable to extinction or extirpation).

Range: *Brotherella roellii* is endemic to the Pacific Northwest, occurring only in southwestern British Columbia and Washington. It is known from Clallam, Jefferson, Pacific, Pierce, Skagit, and Snohomish counties in Washington. It is known from Olympic National Park and from Mt. Baker Snoqualmie National Forest/Mt. Pilchuck State Park.

Specific Habitat: *Brotherella roellii* is reported from cool, moist, open mixed coniferous and deciduous forests, on slopes, stream terraces and swampy floodplains, mostly at low elevations along valley margins. Vine maple and red alder are the preferred hardwood habitat. The substrates include rotten logs, stumps, and bases of trees. Not restricted to old growth.

Threats: Activities that result in lowered humidities and desiccation of the surrounding habitat, such as road building and logging, could have a detrimental effect on this species. Scientific collecting and incidental harvest as a special forest product are additional threats to *Brotherella roellii*. Because this lowland species probably occurs mostly on private lands generally managed with short rotations, protection on federal lands offers the most reliable means for continued viability of the species.

Management Recommendations:

- C Maintain large decay class 3, 4, and 5 logs at known sites. Provide for continuous input of coarse woody debris in various decay classes and diameters for substrate.
- C Provide a mixture of age classes of conifer and deciduous species, and leave the canopy intact to retain optimal light and moisture regimes where known sites could benefit.
- C New road construction should avoid stream terraces to avoid disruption of microclimate and loss of woody debris associated with clearing of rights-of-way which could affect known sites.
- C At known sites, maintain microsite characteristics including canopy closure greater than 70 percent. Avoid disturbance, including scientific collection, unless specifically approved.

Information Needs:

- C Known sites should be surveyed to locate populations (especially type location, near Enumclaw, King Co., Washington). Sites of potential suitable habitat should be surveyed (e.g., low-elevation areas with abundant rotting wood and deciduous trees).

I. Natural History

A. Taxonomic/Nomenclatural History

Brotherella roellii (Ren. & Card.) Fleisch. was originally described in 1890 as *Raphidostegium roellii* Ren. and Card. It was placed in the genus *Sematophyllum* by E.G. Britton in 1902. Fleisher transferred the species to *Brotherella* in 1923 and Buck moved the species to the genus *Pylaisiadelpha* in 1984, unfortunately based on a misinterpretation of the genus *Brotherella*. A discussion of the generic distinctness of *Brotherella* from *Pylaisiadelpha* is provided by Ando, Seki, and Schofield (1989). Anderson et al. (1990) did not accept this last change, so *Brotherella* remains the current name. It is placed in the family Sematophyllaceae.

Synonymy:

Raphidostegium roellii Ren. & Card. 1890

Sematophyllum roellii (Ren. & Card.) Britton Bryologist 5:64-66. 1902

Brotherella roellii (Ren. & Card.) Fleisch. in Musci Fl. Buitenzorg 4:1245 1923

Pylaisiadelpha roellii (Ren. & Card. in Röhl) Buck in Yushania 1(2):13 1984

B. Species Description

1. Morphology (Grout 1932:137, Conard 1944:194-195, Lawton 1971:321, Christy and Wagner 1996)

Brotherella roellii is a trailing moss, with lustrous, glossy green to golden-yellow leaves that are irregularly pinnate, 0.5-3 cm long. The branches are 0.5-1 mm wide when dry. Individual leaves are 0.8-1.2 mm long, stiffly imbricate to complanate and often secund at shoot tips. The cortical cells of stems are inflated and larger than interior cells. The capsules are erect to somewhat inclined, with an oblique mouth. The operculum is 0.8-1.0 mm long with a long, narrow beak. Vegetative material commonly produces brittle shoots that could serve in vegetative propagation.

Morphological characters that distinguish *Brotherella roellii* from similar appearing *Hypnum circinale* and other species include the golden-yellow color and small size, leaves which are not strongly circinate, the long, narrow beaked operculum, and the inflated alar cells. Additional characteristics useful in distinguishing these species are included in Christy and Wagner (1996).

Figure 1. Line drawing of *Brotherella roellii* from Conard (1944) (to be added).

2. Reproductive Biology

Little is known about the reproductive biology of *Brotherella roellii*. It is reported as autoicous, having the male and female organs on the same plant, in separate clusters (Lawton 1971). Sporophytes are found occasionally (Schofield 1976), sometimes in local abundance.

3. Ecology

Brotherella roellii is most common on rotting wood substrates in cool, moist, shaded conditions.

C. Range, Known Sites

Brotherella roellii is endemic to the Pacific Northwest, occurring only in southwestern British Columbia and Washington. This species was documented in Washington during the early 1900's near Enumclaw (type locality), the upper valley of the Nisqually River, and near the town of Davis. It is known from eight collections in Clallam, Jefferson, Pierce, Pacific, Skagit, and Snohomish counties in Washington, with six collected prior to 1915. It is known from Olympic National Park and from Mt. Baker Snoqualmie National Forest/Mt. Pilchuck State Park. In British Columbia, it occurs locally in humid coastal forests below 125 m (400 feet) in elevation (Schofield 1976).

Figure 2. Known sites of *Brotherella roellii* (to be added).

D. Habitat Characteristics and Species Abundance

Brotherella roellii is reported from cool, moist, mixed open coniferous and deciduous forest, on slopes, stream terraces and swampy floodplains, mostly at low elevations along valley margins. Vine maple and red alder are the preferred hardwood habitat. It may occur rarely on bigleaf maple, especially when the tree is young (Schofield, pers. comm.). Substrates include rotten logs (e.g., western redcedar), stumps, and bases of trees (e.g., red alder and dogwood). According to Schofield in British Columbia (pers. comm.), most populations are from secondary forest, not old-growth. *Brotherella roellii* tolerates variation in seasonal light availability. In winter, most populations in deciduous forest are relatively well illuminated (Schofield, pers. comm.).

Brotherella roellii is most common on rotting wood, where it occurs with the mosses *Rhizomnium glabrescens*, *Tetraphis pellucida*, *Plagiothecium laetum*, and *Hypnum circinale*, and the liverworts *Lepidozia reptans*, *Blepharostoma trichophyllum* and *Cephalozia media*. These common species are typical of rotting wood in cool, shaded and moist habitats, especially on stream terraces and floodplains.

II. Current Species Situation

A. Why Species is Listed under Survey and Manage Standards and Guidelines

Brotherella roellii was not rated by the Forest Ecosystem Management Assessment Team bryophyte viability panel because it was poorly known. It was listed in the Record of Decision

Table C-3 as a Strategy 1 and 3 species, with direction to manage known sites and conduct general inventories (USDA Forest Service and USDI Bureau of Land Management 1994).

The limited information available suggests that this species inhabits lowland forests which occur mostly on private land and in urban areas that have been developed since the time of the original collections.

B. Major Habitat and Viability Considerations

Because this lowland species probably occurs mostly on private forest lands generally managed with short rotations, protection on federal lands offers the best chance for continued viability of the species. Species in this habitat may be sensitive to changes in light level and microclimate caused by removal or thinning of the canopy. They also depend on continuous input of coarse woody debris in various decay classes and diameters for their substrate. Habitats with a mixture of age classes and both conifer and deciduous species appear to be preferred. The canopy should be left intact to retain existing light and moisture regimes.

C. Threats to the Species

Brotherella roellii inhabits lowland, accessible areas and occurs on lower tree bases and rotten wood, making it vulnerable to incidental moss harvest of special forest products. Because it superficially resembles the common moss, *Hypnum circinale*, accidental harvest could occur, although it is very small and attaches closely to the substrate. Activities that result in desiccation, such as road building and logging could have a detrimental effect on this species. Two sites are near trails (Mink Lake in Olympic National Park and Mt. Pilchuck, Mt. Baker Snoqualmie National Forest/Mt. Pilchuck State Park), where incidental recreational impacts could occur.

D. Distribution Relative to Land Allocations

Given the vague locality data from the early herbarium collections, it is not possible to determine their current land allocation. It is likely that the Enumclaw population has been extirpated. Only one population is known to occur on federal land in the Mink Lake and Low Divide areas of the in Olympic National Park. The Mt. Pilchuck site may be on state (Mt. Pilchuck State Park) or federal land (Mt. Baker Snoqualmie National Forest). Other known sites are either on state or private land, although locality information is not precise. The land around the town of Ashford is private and state owned, the Skagit River corridor, near the town of Hamilton is mostly privately owned and designated as wild and scenic river, the Brinnon site may be within the Dosewallips State Park or on private land.

III. Management Goals and Objectives

A. Management Goals for the Taxon

The goal for the management of *Brotherella roellii* is to assist in maintaining species viability.

B. Specific Objectives

Any disturbance at known sites of this presumed rare species should be avoided until sufficient information is available to suggest management will not result in extirpation of the populations.

- C Avoid disturbance of substrate and overstory at known sites.
- C Maintain microclimate, especially cool, moist conditions at known sites.

IV. Habitat Management

A. Lessons from History

There is a considerable literature on the decline of bryophytes in Europe. Rapid decrease and fragmentation of primeval forests have caused a serious threat to bryophytes (ecologically similar to *Brotherella roellii*) that grow on decaying wood (Laaka 1992). In addition, air pollution (particularly sulphur compounds in combination with low pH) and acid rain are implicated in decline of bryophytes (Hallingbäck 1992, Rao 1982). The extinction rate and rates of decline are high in areas where trends are documented (Greven 1992, Hallingbäck 1992). Factors associated with logging that cause declines in bryophytes include the temperature extremes and the drying effect of increased wind, the lowering of surface water, and desiccation of logs, reduction in amount of coarse woody debris substrate, increased dispersal distance between fragments of primeval forest (Laaka 1992). Lack of suitable substrate is the main reason for rarity of threatened decaying wood inhabiting species in managed forests.

B. Identification of Habitat Areas for Management

Until populations are located, it is not possible to identify specific habitat areas for management. Any known site that is located or discovered will be considered a habitat area, with the management guidelines described below applied to the site.

C. Management within Habitat Areas

- C Maintain large decay class 3, 4, and 5 logs at known sites (USDA Forest Service and USDI Bureau of Land Management 1994, p. C-27). Provide for continuous input of coarse woody debris in various decay classes and diameters for substrate.
- C At known sites, maintain microsite characteristics. Provide a mixture of age classes and conifer and deciduous species, and leave the canopy intact to retain optimal light and moisture regimes. Specially, at known sites maintain canopy closure greater than 70 percent (USDA Forest Service and USDI Bureau of Land Management 1994, p. C-27).
- C New road construction should avoid stream terraces to avoid disruption of microclimate and loss of woody debris associated with clearing of rights-of-way which could affect known sites.
- C Avoid direct and indirect disturbance, including scientific collection, unless specifically approved.

D. Other Management Issues and Considerations

Although the sensitivity of this taxon to air pollution is unknown, bryophytes may be sensitive to air pollution (Rao 1982). Habitat for *Brotherella* is likely to be in areas with highest pollution

concentrations, particularly sulfur dioxide, to which many bryophytes are highly sensitive (Nash and Nash 1974)

V. Research, Inventory and Monitoring Needs

A. Data Gaps and Information Needs

Due to the vague description of the type location (near Enumclaw, King Co., Washington) it may be difficult to reconstruct where this original collection was made. However, efforts to locate this site are worth pursuing. Known sites should be surveyed to locate populations and verify their status (especially the type location, near Enumclaw, King Co., Washington), and low-elevation areas with abundant rotting wood and deciduous trees should be examined, especially logs and stumps populated by *Hypnum circinale*, where *Brotherella* occur as an associated species.

The abundance, distribution and ecology of this species in the region is poorly known. Inventories should be conducted to locate additional populations of this species, characterize its habitat, and provide ecological information. Information such as abundance, non-vascular and vascular plant associates, and specific habitats would contribute to understanding ecological requirements.

B. Research Questions

Limited information on *Brotherella roellii* is available. Initial research should focus on surveying known sites and verifying the status of populations.

What are the ecological requirements of this species? Is it closely associated with late-successional and old-growth forests within our portion of its range?

C. Monitoring Needs and Recommendations

No monitoring recommendations are identified at this time. Once populations are located, a regional monitoring protocol may be developed to track population trends.

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